Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

NOTES AND LITERATURE

NOTES ON HEREDITY

Miss Wheldale presents an interesting theory concerning the formation of anthocyanin.[1] The theory for which a good deal of evidence is presented is that of the reversible reaction

$$\text{Glucoside} + \text{water} = \text{chromogen} + \text{sugar},$$

which is controlled by one or more enzymes.

Whether this reaction shall go forward or backward depends upon the relative amount present of the various substances entering it and upon the nature and quantity of the enzymes which bring about the reaction. She points out that certain species having flowers, leaves, etc., slightly or not at all colored give rise to colored varieties which are recessive to the type. These facts are explained if we assume that the colored forms arise because of the absence in the color tissue of the enzyme which causes the synthesis of the glucoside. Under these conditions, chromogen which is formed would be free and available for oxidation into pigment. In the type the enzyme is supposed to be present, and the condition of equilibrium is such that all, or nearly all, of the chromogen unites with sugar and hence can not be oxidized.

In the *Journal of Morphology* for March, 1911, Wilson gives a very interesting discussion of the chromosome behavior in *Nezara,* following which he gives a discussion of the possible ways in which the idiochromosomes may be changed in number.

One of the most interesting things in this paper to the student of genetics is the high degree of probability which Wilson shows to exist that the behavior of the idiochromosomes is not only accountable for sex inheritance, but for the inheritance of certain sex-limited characters. He points out that cytological considerations render it probable that the morphological dimorphism of the spermatozoa in certain species has arisen by the transformation of a single pair of chromosomes, producing an XY pair. He also shows that in certain species the XY pair of chromosomes may be interpreted as an X chromosome attached to one member of a pair of Y chromosomes, thus one of the members being an XY combination, the other Y.

---

[1] M. Wheldale on "The Formation of Anthocyanin," *Journal of Genetics,* I, No. 2, March, 1911.

He then calls attention to the very interesting case of the inheritance of white eye found by Morgan in one of his *Drosophila* mutants. This mutation appeared first in the male. When this male was crossed with the normal red-eyed female the progeny all had red eyes; but in the next generation some of the males showed white eye again. Morgan has shown that in a cross of this kind it is only the female progeny which transmits the abnormality, and although she transmits it to half of both sexes of her offspring it does not appear in the female. It is possible, however, to secure females with white eyes.

These facts are all explainable on the following basis. Let WF represent the X element in which white eye is associated with the female determiner. RF would then represent the X element in red-eyed individuals. The formula for the white-eyed male would be WF.Y. The formula for the normal female is RF.RF. These mated give WF.RF females and RF.Y males; but since R is dominant to W these females have red eyes.

If now these heterozygous females be mated with ordinary males, the following four types of progeny are produced: WF.RF females, RF.RF females, WF.Y males, RF.Y males. Thus half of the males in this generation will have white eyes. But if a heterozygous female be mated with a white-eyed male, half of the female progeny and half of the male progeny will have white eyes.

Wilson points out that these phenomena exactly parallel behavior which he has found in the X and Y chromosome elements of certain species, where the X element plainly consists of an X chromosome united to a Y chromosome, while the synaptic mate is a Y chromosome. If in such a species a mutation like that of the white eye of *Drosophila* occur as a result of the loss of some characteristic on the part of the Y chromosome which constitutes a part of the X element, then such mutation would behave exactly as Morgan found this white-eye mutation to behave in *Drosophila*.

In referring to this parallel in the behavior of the chromosomes and of this mutation Wilson remarks: "So precise is the correspondence of all this with the course of sex-limited heredity of this type that it is difficult to resist the conclusion that we have before us the actual mechanism of such heredity—in other words, that some factor essential for sex is associated in the X element with one that is responsible for the sex-limited character."

The author points out other important parallels of a similar nature. To the cytologist probably the most interesting part of Wilson's paper is the suggestion he makes regarding the possible origin of the X and Y elements. On the whole, this paper greatly strengthens the hypothesis that there is some kind of definite relation between the chromosomes and Mendelian factors in heredity.

Doncaster, in the *Proceedings* of the Cambridge Philosophical Society[2] gives a short note on the spermatogenesis of *Abraxis grossulariata* (currant moth), in which he had previously shown that the *grossulariata* character is a sex-limited, dominant Mendelian factor, not borne by eggs bearing the female determiner. He finds the mitoses very small, and was unable to count the chromosomes satisfactorily, but says there are between fifty and sixty. Two kinds of primary spermatocytes are found, in different follicles. One of these appears to be abnormal and is thought not to be functional in fertilization. There is no evidence that the male produces two kinds (male and female determining) of spermatocytes, such as are found in many species. The number of chromosomes visible in the equatorial plate of the first spermatocyte division, as well as in the second, is twenty-eight. The oogonial mitoses do not differ recognizably from the spermatogonial.

In this moth the female produces two kinds of eggs, one female producing and wanting in the *grossulariata* character, the other male-producing and with or without this character according as the female is of the *grossulariata* or the *lacticolor* type. It is to be expected that the chromosomal provision of the two kinds of eggs would be different; yet, as Wilson and others have shown in some species for males, the differential chromosomes may not be distinguishable. Doncaster's results are consistent with the latter suggestion.

Doncaster also gives some interesting results of a test of a theory of sex inheritance which has gained considerable popular credence.[3] The theory is that one ovary produces female-producing eggs, the other male-producing eggs. The test was made on female albino rats. In one individual the right ovary was removed, in the other the left. Both females subsequently produced offspring of both sexes. Post-mortem dissection of the two females showed that the operation of removing an ovary had been entirely successful, and new ovarian tissue had not been regenerated. These results disprove the theory so far as concerns these animals.

---

[2] Vol. XVI, Pt. I.

[3] *Journal of Genetics,* Vol. I, No. 1, November 18, 1910.

In the March number of the *Zeitschrift für Induktive Abstammungs- und Vererbungslehre* Dr. Gates presents a very interesting paper on the inheritance of pigmentation in *Œnothera.* He shows that some quantitative variations in the pigmentation of the calyx of *O. rubrinervis* are not hereditary, while other quantitative variations are hereditary. One striking case of a mutant which produces an increased amount of anthocyanin was found in his investigations.

To most students of genetics the most interesting part of Dr. Gates's paper will be his discussion on pages 367–8 of the probable nature of the differences between genotypes which furnish us our Mendelian character pairs. The evidence he presents is strongly against the assumption that all of these hereditary differences are due to the loss or origination of definite cell organs which can be looked upon as the physical basis of the separately heritable characters. Rather, "Everything points to its being what it appears to be, namely, a positive variation in some physiological factor concerned in anthocyanin formation. It is not necessary to think of a form as having lost an inhibitor, but rather has there been a quantitative readjustment of the relation between the substances which by their chemical interactions produce anthocyanin, and those which decompose it as soon as formed, or which by their presence divert the metabolic processes and bring about chemical reactions of a different sort."

He states that the appearance and behavior of the mutant above referred to (*O. rubricalyx*) can not be explained on the basis of the presence or absence of any factor or substance in this mutant which is not also present in *O. rubrinervis.* "Obviously the germinal change has been rather in a quantitative readjustment, and it would seem that many, though not necessarily all, the cases of Mendelian color inheritance are explainable on a similar quantitative basis rather than by a presence-absence hypothesis."

He calls attention to the well-known fact that, especially in organic chemistry, many reactions may go in quite different directions according to the relative amounts of the reacting substances present, and suggests that many of the phenomena of heredity are due to changes in the relative amounts of substances produced by the metabolic activities within the cell.

Even white varieties, which are frequently referred to as having lost the factor for color, may originate merely from a change in the quantity of some substance or substances present. That many white flowers do not owe their lack of pigment to the absence of a pigment-producing factor is shown by the fact that such flowers frequently show pigment in exceptional individuals, and many white flowers develop more or less pigment with age. Presumably, as the flower passes its prime, there may be changes in the rate at which various metabolic processes go forward, and this may induce pigment formation.

In *Science* for May 31, 1911, Professor Morgan gives some interesting data concerning the origin of a number of mutations in *Drosophila.* In a culture treated with radium one fly was produced the marginal vein of whose wings was beaded, and this character appeared in a very small proportion of the next generation. The proportion of beaded wings increased from generation to generation until a stock was produced that gives, in certain cultures, nearly 100 per cent. of the new character.

In the seventh generation of the beaded-wing stock a fly appeared with the end of the wings cut off nearly squarely, and indented at the ends, or somewhat scalloped. This character is confined almost exclusively to the female line. In the next generation twenty-one flies, with truncated wings, appeared along with 230 having normal wings. In the third generation some of the truncated-winged flies produced nearly 50 per cent. of truncated wings.

In the second generation of the beaded-wing flies a male appeared with wings shorter than the abdomen. A similar mutation occurred in a related stock. These abnormal flies bred together have produced 964 normal males and females, six short-winged males and two females.

In the seventh generation of the beaded-wing stock a fly appeared with wings like the normal in form but extending no further than the end of the abdomen. This character proves to be sex limited.

Occasionally flies have appeared, especially in the truncated-wing stock, with each wing swollen up to a balloon or a bladder filled with fluid. Practically a pure stock of this mutation is now on hand.

Several times flies have appeared that failed to develop black pigment in the body. These flies have produced no offspring.

A melanistic mutation has also occurred, and a pure stock of it was easily produced.

A male appeared in the melanistic stock having gold and yellow wings: "In fact, the entire fly is conspicuously yellow. This color proves to be sex-limited. Thus far it has appeared only in the males."

Professor Morgan has undoubtedly uncovered some new and interesting facts, and it is hoped that he will be able to discover something concerning the underlying causes of these mutations.

In *Science*, May 19, 1911, Loeb and Bancroft report experiments on the production of mutants in *Drosophila*. They secured four types of mutation; a dark form, a pink eye, a white eye, and a short-winged form. The dark form and the pink-eyed form occurred also in control cultures, and the authors think it is probable that the white-eyed mutation originated before the treatment. The short-winged mutants have appeared thus far only in cultures treated with radium, but in only two out of several hundred such cultures. The treatments used were high temperatures, exposure to radium, and exposure to Roentgen rays. Where mutations were obtained in the treated cultures they occurred in only a very small proportion of the cultures, and the authors appear to doubt whether or not the treatment was responsible for the mutations.

Professor Cockerell, in the *Annals and Magazine of Natural History*, Series 8, Vol. VII, April, 1911, describes a very interesting case in which apparently a female bee, in a genus (*Megachile*) in which the female appears to be heterozygous for the secondary sexual characters, with the female characters dominant, has lost these secondary sexual characters and assumed those of the male. He proposes a new genus (*Androgynella*) for this marked variation from allied forms. Cytological study of these two related genera might reveal something of marked interest.

I wish to draw special attention to the very able article by Professor Michael F. Guyer which appeared in this journal for May, 1911, under the title "Nucleus and Cytoplasm in Heredity." Professor Guyer in this article gives the best presentation I have seen of the relation of the various parts of the cell to the phenomena of heredity. It is not necessary to review the paper here in full, since it is available to the readers of this journal.

W. J. SPILLMAN.